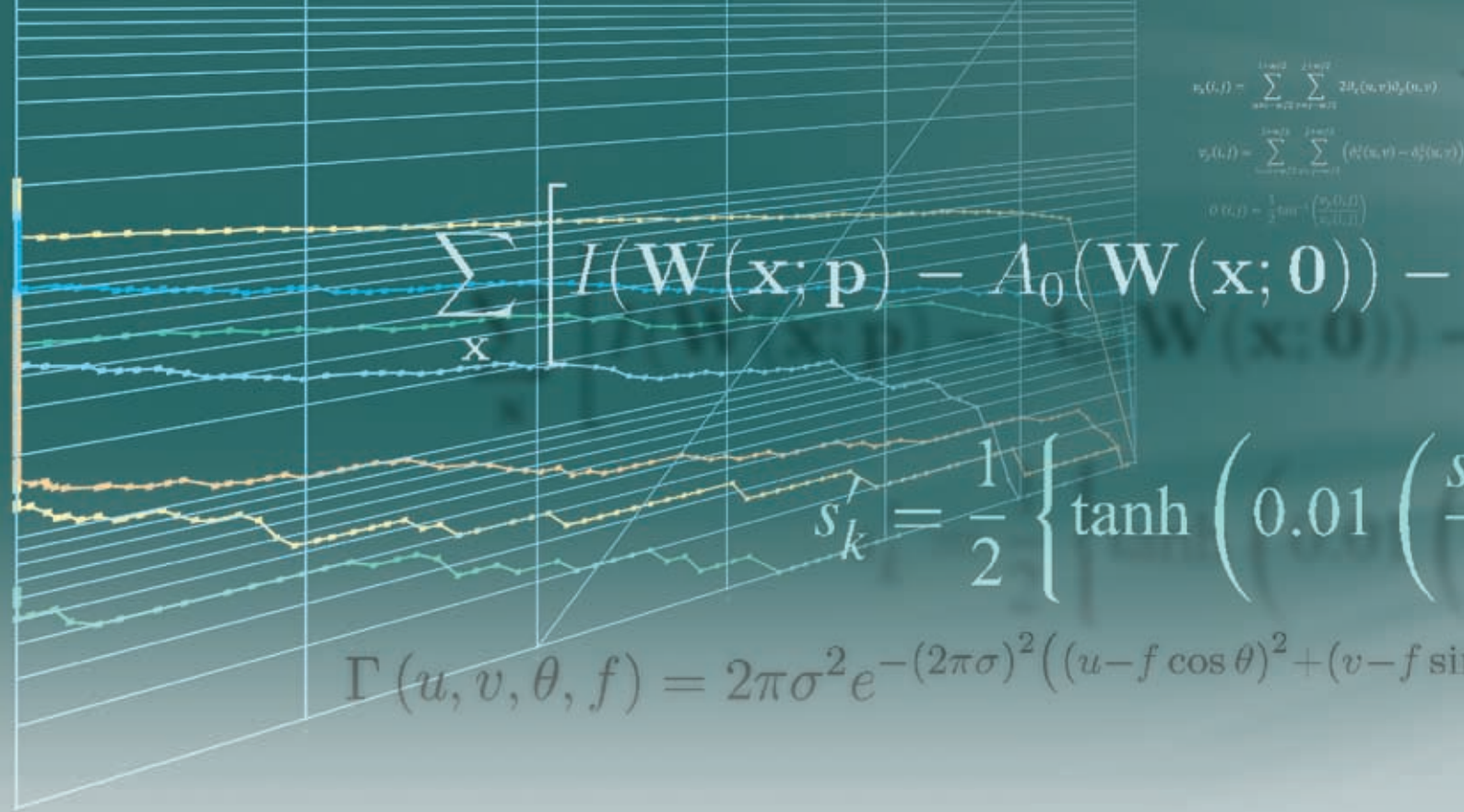




NEUROtechnology



Core
Technology
for Your
Application



About

- 22 years of experience
- Proven technologies
- Customers in 100+ countries
- Unlimited free technical support

Neurotechnology is a provider of high-precision biometric **fingerprint**, **face**, **iris**, **voiceprint** and **palm print** identification algorithms, object recognition technology and software development products. More than 2,500 system integrators, security companies and hardware providers integrate Neurotechnology's algorithms into their products. With millions of customer installations worldwide, Neurotechnology's products are used for both civil and forensic applications, including border crossings, criminal investigations, systems for voter registration, verification and duplication checking, passport issuance and other national-scale projects.

Drawing from years of academic research in the fields of neuroinformatics, image processing and pattern recognition, Neurotechnology was founded in 1990 in Vilnius, Lithuania and released its first fingerprint identification system in 1991. Since that time the company has released more than 80 products and version upgrades for identification and verification of objects and personal identity.

Neurotechnology's identification algorithms have consistently earned the highest honors in some of the industry's most rigorous competitions, including the National Institute of Standards and Technology (NIST)'s Fingerprint Vendor Technology Evaluation (FpVTE) and the Fingerprint Verification Competitions (FVC).

Neurotechnology also performs research and development in artificial intelligence and mobile autonomous robotics fields. A **computer-based vision** and **object recognition** technology and SDK for various applications is available.



Technology Awards

- **IREX Evaluation.** In 2012 VeriEye iris recognition algorithm was judged by the National Institute of Standards and Technology (NIST) as one of the fastest and most reliably accurate iris recognition algorithms among those tested. The NIST Iris Exchange (IREX) evaluated more than 86 algorithms and versions from 9 companies and 2 universities. Neurotechnology iris matching algorithm was the second fastest and provided 3 times higher recognition accuracy than the only faster contender. Neurotechnology also showed similar results in the earlier IREX evaluation in 2009.
- **WSQ 3.1 Certification.** In 2011 FBI certified Neurotechnology's implementation of WSQ image format support.
- **MINEX Compliance.** In 2007 MegaMatcher SDK fingerprint technology was recognized by the NIST as fully MINEX compliant. This MINEX compliance recognition allows to use MegaMatcher in Personal Identity Verification program (PIV) applications. MegaMatcher fingerprint technology is also used in VeriFinger SDK.
- **FVC2006 - Fingerprint Verification Competition.** Neurotechnology achieved the highest ranking when using the most realistic benchmark for real-world biometric applications, "Average Zero FMR." Neurotechnology also won four gold medals, two silver and two bronze medals in the FVC2006 Open Category, and took second place in the FVC2006 Light Category, according Average Zero FMR benchmark winning one gold and four bronze medals in this category. The competition was organized by Biometric Systems Lab (University of Bologna), Pattern Recognition and Image Processing Laboratory (Michigan State University) and the Biometric Test Center (San Jose State University). Neurotechnology also showed one of the best reliability results in previous competitions: FVC2000, FVC2002 and FVC2004.
- **FpVTE 2003 - The Fingerprint Vendor Technology Evaluation.** Neurotechnology's algorithm achieved one of the best reliability results in the Middle Scale Test among FpVTE 2003 participants. The evaluation was conducted by NIST on behalf of the Justice Management Division (JMD) of the US Department of Justice. *Results shown from the NIST FpVTE 2003 do not constitute endorsement of any particular system by the government.*



MegaMatcher SDK

*Proven in national-scale projects,
including passport issuance and voter deduplication*

Large scale AFIS and multi-biometric identification

- NIST MINEX compliant algorithm
- Multi-biometric: fingerprints, faces, voiceprints, irises and palm prints
- Scalable cluster architecture
- ANSI and ISO biometric standards support
- Fingerprints, irises and faces can be matched on smart card using MegaMatcher On Card
- Mobile client apps for tablets or smartphones can be developed using Embedded SDK

MegaMatcher technology is intended for large-scale AFIS and multi-biometric systems developers. The technology ensures high reliability and speed of biometric identification even when using large databases.

MegaMatcher is available as a software development kit that allows development of large-scale single- or multi-biometric fingerprint, face, voice, iris and palm print identification products for Microsoft Windows, Linux and Mac OS X platforms.

The most prominent MegaMatcher SDK integration examples are:

- **Bangladesh Voter Registration Project** registered more than 80 million citizens using biometric face and fingerprint technology.
- **Indian States Criminal AFIS** solution has been deployed in the police departments of seven Indian states and the National Institute of Criminology and Forensic Science of India.
- **Indonesia distributed passport issuance system** with a centralized biometric matching component based on MegaMatcher technology.
- **El Salvador's National Passport System** – the nationwide multi-biometric passport and immigration system based on MegaMatcher multi-biometric technology.
- **Bosnia and Herzegovina Biometric Passport and ID System** is based on MegaMatcher technology
- **Border control systems in Spanish airports** use MegaMatcher for multi-biometric face and fingerprint identification.

MegaMatcher SDK is available for a competitive price with flexible licensing options and free customer support.



These types of MegaMatcher SDK are available:

- **MegaMatcher Standard SDK** for developing a client/server based multi-biometric fingerprint-face-voice-iris identification product. This SDK is suitable for network-based and **web-based** systems with database size ranging from several thousand records up to million records. The SDK includes ready-to-use server-side software and a set of components for developing client-side applications. Also one or more MegaMatcher Accelerator units or installation licenses can be additionally purchased for building high performance systems that match hundreds of millions fingerprints and/or irises per second.
- **MegaMatcher Extended SDK** for developing a large-scale network-based AFIS or multi-biometric identification product. The fault-tolerant **scalable cluster** software allows to perform fast parallel matching, processes high number of identification requests and handles databases with practically **unlimited size**. The SDK includes all components of MegaMatcher Standard SDK and ready-to-use cluster server and node software. This SDK also allows to develop **network-based** and **web-based** systems.

MegaMatcher 4.3 biometric engines technical specifications (for a single PC with Intel Core i7-2600 processor running at 3.4 GHz)				
	Fingerprints	Faces	Irises	Voiceprints ⁽¹⁾
Minimal image resolution or size	500 ppi	640 x 480 pixels	640 x 480 pixels	-
Template ⁽²⁾ extraction time (seconds)	0.16 - 0.18	0.06 - 0.15	0.08 - 0.10	0.08 - 0.10
Template ⁽²⁾ size (kilobytes)	0.7 - 6.0	4.0 - 35.2	2.3	4.5 - 5.0
Template ⁽²⁾ matching speed ⁽³⁾ (templates per second)	90,000 - 280,000	120,000 - 2,100,000	520,000 - 2,200,000	1,000 - 1,800

(1) Specifications are provided for 5-second long voice samples; all specifications have linear dependence from voice sample length.

(2) Here one template contains one biometric record (fingerprint, face, voiceprint or iris respectively). MegaMatcher SDK allows to store multiple biometric records (fingerprints, faces, voiceprints and irises) in a single template. The template extraction times are provided for one processor core.

(3) The matching speed is given as a range, where the smaller number corresponds to **maximized matching accuracy** scenario, whereas the larger - to **maximized matching speed** scenario. The values are provided for running the matching on four processor cores.

MegaMatcher **SDK Trial** and **product brochure** can be downloaded from Neurotechnology web site.





MegaMatcher Accelerator

Solution for large-scale AFIS or multi-biometric systems

- Ready-to-use
- Fast matching
- Multiple modalities support
- Scalable architecture
- ISO & ANSI standards support
- Suitable for duplicates search

MegaMatcher Accelerator 4.0 is a solution for fast template matching on the server-side part of a large-scale AFIS or multi-biometric system. The **Extended** version includes server hardware and software for fast biometric template matching on the server-side of a large-scale AFIS or multi-modal system. The **Standard** version is intended to be run on a common PC and does not include any hardware.

- **MegaMatcher Accelerator 4.0 Extended** is ready-to-use solution that includes server hardware, pre-installed operating system and fast multi-biometric identification software. The solution does not require any additional configuration and accepts requests from client software via network or Web.
- **MegaMatcher Accelerator 4.0 Standard** is intended to be run on a PC with Core i7 processor and 12 GB of RAM. This version does not include any hardware and is provided as an installation CD.
- **Fast matching.** A PC with MegaMatcher Accelerator 4.0 Standard software can match up to **35 million fingerprints** per second or up to **70 million irises** per second in 1-to-many mode. A single MegaMatcher Accelerator 4.0 Extended unit can match up to **100 million fingerprints** per second or up to **200 million irises** per second in 1-to-many mode using Neurotechnology proprietary biometric template format.
- **Multiple modalities support.** MegaMatcher Accelerator 4.0 can be used within a biometric system that contains templates with any number of fingerprint, iris and/or face records.
- **Suitable for duplicates search.** Searching for duplicates in a biometric templates database is a task that requires many computations. MegaMatcher Accelerator provides enough productivity to complete duplicate searching in a reasonable time.



The MegaMatcher Accelerator 4.0 Extended solution consists of HP ProLiant server hardware and MegaMatcher Accelerator software running on Linux OS. Each MegaMatcher Accelerator 4.0 Extended unit can store **40,000,000 fingerprints** or **50,000,000 irises**.

The MegaMatcher Accelerator 4.0 Standard software is intended to run on a PC with Intel Core i7 processor and 12 GB of memory. Each PC with MegaMatcher Accelerator 4.0 Standard software can store **4,000,000 fingerprints** or **5,000,000 irises**.

Multiple MegaMatcher Accelerator units can be combined to reach higher productivity using the included cluster software.

MegaMatcher Accelerator 4.0 Extended units and MegaMatcher Accelerator 4.0 Standard licenses can be purchased by new and existing MegaMatcher SDK, VeriFinger SDK or VeriEye SDK customers.

The table below shows the performance of MegaMatcher Accelerator 4.0 fast fingerprint and iris matching engines

Matching speed for a single MegaMatcher Accelerator 4.0 unit (templates per second)				
One template contains:	MegaMatcher Accelerator 4.0 Extended		MegaMatcher Accelerator 4.0 Standard	
	Maximized speed scenario	Maximized accuracy scenario	Maximized speed scenario	Maximized accuracy scenario
1 fingerprint record	100,000,000	90,000,000	35,000,000	32,000,000
2 fingerprint records	55,000,000	40,000,000	18,000,000	15,000,000
4 fingerprint records	26,000,000	19,000,000	8,000,000	6,500,000
8 fingerprint records	12,000,000	8,500,000	4,000,000	3,000,000
10 fingerprint records	10,500,000	6,000,000	3,500,000	2,000,000
1 iris record	200,000,000		70,000,000	
2 iris records	100,000,000		35,000,000	

Neurotechnology can provide access to MegaMatcher Accelerator Standard or Extended units running at Neurotechnology office for **evaluation** purposes. Please contact us for more information.





MegaMatcher Embedded SDK

Mobile multi-biometric identification

- AFIS-level accuracy on smartphone or tablet
- NIST MINEX-compliant algorithm
- Fused fingerprint, face, voiceprint and iris matching algorithm
- Compact multi-biometric templates
- Compatibility with other MegaMatcher-based products
- Single-biometric SDKs for Android are optionally available

MegaMatcher Embedded technology is designed for developers of mobile AFIS and multi-biometric systems. The technology ensures high quality biometric recognition that is suitable for use in large-scale AFIS or multi-biometric systems.

MegaMatcher Embedded includes fingerprint, facial, speaker and iris recognition engines along with a fused algorithm for reliable multi-biometric identification. The engines and the fused algorithm are ported for ARM-based processors from the MegaMatcher SDK, thus the technology provides **AFIS quality** biometric recognition. The biometric engines are able to process a fingerprint or face image, or a voice sample in less than 1 second on a smartphone with a 1 GHz processor.

The MegaMatcher Embedded fingerprint engine is **MINEX-compliant**, as it is a port of PC-side MegaMatcher SDK fingerprint engine that had been recognized by NIST as suitable for use in PIV program applications.

MegaMatcher Embedded is available as a software development kit that enables development of stand-alone or Web-based multi-biometric solutions for smartphones, tablets and other devices that are running **Android** OS. The SDK can be used for developing stand-alone multi-biometric applications or mobile clients for large-scale AFIS. The server part of an AFIS can be based on MegaMatcher SDK or MegaMatcher Accelerator that are fully compatible with the MegaMatcher Embedded SDK.

MegaMatcher Embedded **SDK Trial** and **product brochure** can be downloaded from Neurotechnology web site.



MegaMatcher Embedded 1.1 biometric engines technical specifications

for Java applications running on a device with Nvidia Tegra 250 T20 system on chip (ARM Cortex-A9 processor @ 1.0 GHz)

	Fingerprints	Faces	Irises
Minimal image resolution or size	500 ppi	640 x 480 pixels	640 x 480 pixels
Template extraction time (seconds)	0.9 - 1.3	0.45	0.40
Template size (kilobytes)	0.7 - 5.5	4.0 - 35.2	2.3
Template matching speed (templates per second)	1,100 - 12,000	450 - 10,000	5,500 - 12,000

Specifications notes:

1. The template extraction and matching speeds are provided for one processor core.
2. The matching speeds are provided as a range, where the smaller number corresponds to **maximized matching accuracy** scenario, whereas the larger - to **maximized matching speed** scenario.
3. MegaMatcher Embedded allows to store multiple biometric records of the same or different biometric modalities in a template; in this case the template size is the sum of all included biometric records.
4. Fingerprint template extraction speeds are provided for fingerprint images ranging from 300x300 to 500x500 pixels. Databases with 500 or more fingerprint templates are recommended to achieve the high matching speed value; use with smaller fingerprint databases typically yields lower speed.
5. Face template extraction speeds are provided for the default face roll, pitch and yaw tolerance values (± 15 degrees). These values can be changed to increase tolerance to face posture.

The voiceprint template extraction and matching engine is able to process a 5 second-long voice sample in less than 1 second on the specified hardware platform. A voiceprint template, extracted from the 5 second-long voice sample, requires 5 kilobytes of memory.

The MegaMatcher Embedded SDK includes all necessary components for developers, Java language programming samples and documentation.



MegaMatcher On Card SDK

Smart card multi-biometrics

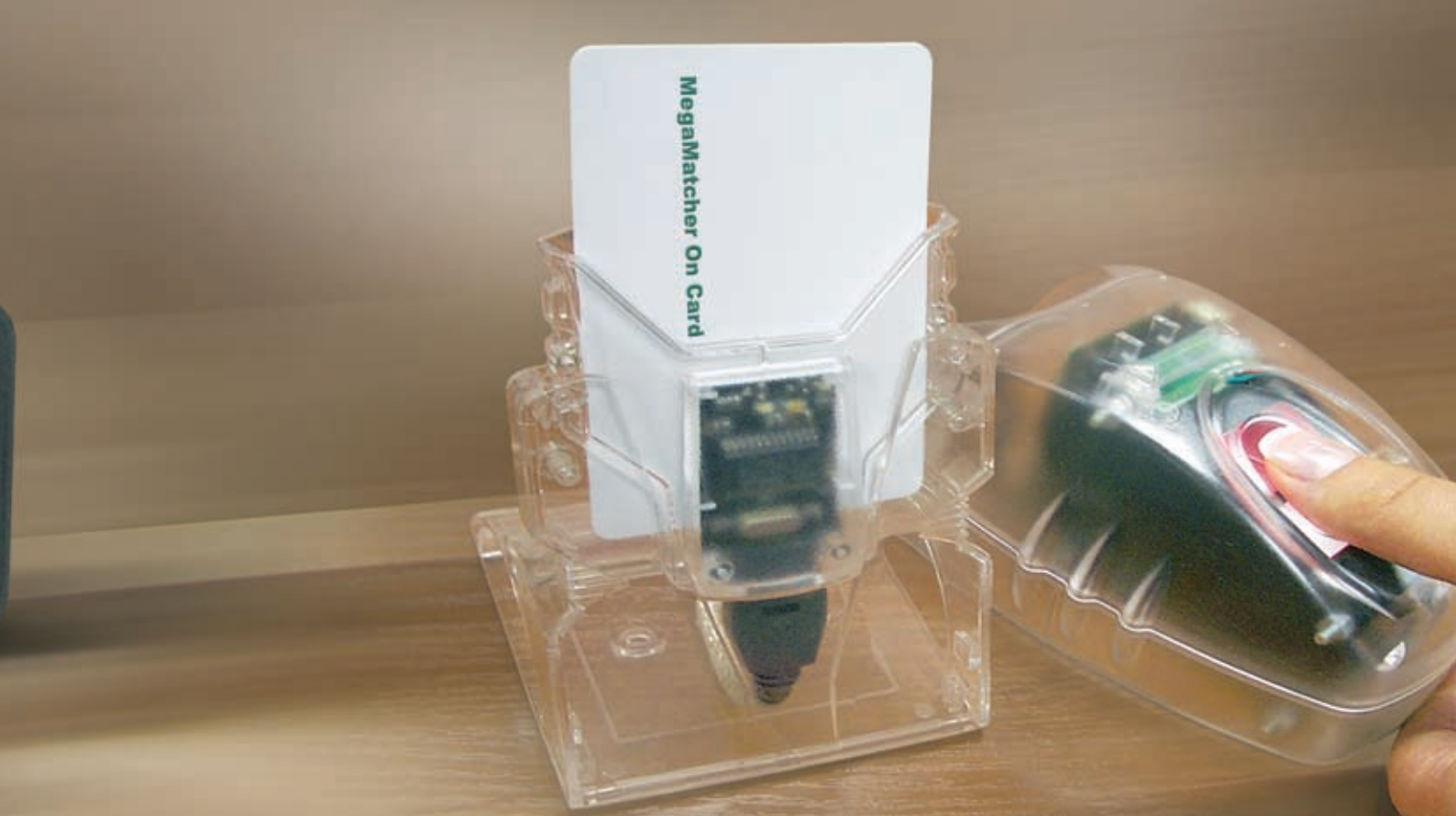
- PC-like verification accuracy
- Configurable verification modes
- Multibiometrics support
- Security and privacy
- ISO/IEC standards support
- Easy integration
- Multiplatform

MegaMatcher On Card SDK offers matching on card technology that stores person's fingerprint, iris and face templates on a smart card and **performs template matching in a microprocessor embedded in the card** instead of matching biometric information on a PC's processor. This method ensures that personal biometric information does not transfer to an external computer as it would in a more basic template-on-card system.

The MegaMatcher On Card SDK is developed utilizing a set of ISO/IEC standards to enable interoperability with and easy integration into existing smart card and/or biometric systems.

MegaMatcher On Card algorithm is based on MegaMatcher multi-biometric technology and provides a number of advantages over a standard fingerprint/iris/face identification system or similar products for smart cards, including:

- **Accuracy.** MegaMatcher On Card provides the same level of accuracy of an AFIS system in a verification process using ISO/IEC 19794-2 compact card minutiae format templates together with the security of storage of biometric templates and matching algorithm on a smart card. Face and iris modalities on-card verification precision conforms to the large scale multi-biometric MegaMatcher SDK accuracy rates of Neurotechnology's compact format templates matching.
- **Configurability.** MegaMatcher On Card fingerprint algorithm has different performance configurations that can be chosen according to the operating scenario, the requirements to matching accuracy, the smart card platform speed and memory constraints.
- **Multi-biometrics.** The face and iris matching engines can be used as an additional or alternative factor of authentication that enhances the fingerprint verification. Fingerprint, iris and face templates can be stored on a single card together with the fingerprint, iris and face matching algorithms.



MegaMatcher On Card SDK provides a number of advantages over a standard fingerprint, iris and face identification system or similar products for smart cards, including:

- **Easy integration.** Implementing the system will not require major overhauls of existing infrastructure, as MegaMatcher on card is developed utilizing a set of ISO/IEC standards (7816-3, 7816-4, 7816-9, 7816-11 and 19794-2) to enable interoperability with and easy integration into existing smart card and/or biometric systems.
- **Different smart card platforms supported.** MegaMatcher On Card can be integrated at different stages of the card life cycle for various smart cards platforms. The post-issuance library gives the possibility to rapidly integrate matching on card in projects where time constraints are critical. On the other hand the possibility to store the code directly into the ROM mask and the partnership with several card vendors offer a faster matching on card solution and the possibility to maintain more EEPROM available for post-issuance applications.
- **Security.** Biometric verification can replace or be combined with less secure (e.g., PIN) authentication techniques to achieve higher security.
- **Privacy.** The original template remains on the smart card, providing a safeguard against misuse of information or fraudulent scanning systems.

Memory requirements for MegaMatcher On Card 3.1 biometric verification engines

	Code size	Required RAM for data	Template size
Fingerprint verification engine ⁽¹⁾	6.0 - 9.3 kilobytes	960 - 1,400 bytes	1,300 - 1,700 bytes
Fingerprint verification engine ⁽²⁾	less than 13.3 kilobytes	less than 600 bytes	less than 1 kilobyte
Face verification engine ⁽²⁾	less than 4.4 kilobytes	less than 16 bytes	less than 2.7 kilobytes
Iris verification engine ⁽²⁾	less than 8.3 kilobytes	less than 700 bytes	less than 1.1 kilobytes
Tri-modal verification engine ⁽²⁾	less than 22 kilobytes	less than 800 bytes	see specific modalities above

(1) Native level integration (maximized accuracy configuration)

(2) Java Card post-issuance libraries (maximized speed configuration)

Template matching speed depends on microcontroller capabilities and operating system of a specific smart card model.

MegaMatcher On Card SDK **product brochure** is available for downloading from Neurotechnology web site.





VeriLook SDK

More than a million algorithm deployments worldwide.

Face identification for PC and Web solutions

- Live face detection
- Webcam capable
- Multiplatform
- Numerous programming samples
- Embedded SDK for Android devices optionally available
- Surveillance SDK optionally available

VeriLook facial identification technology is designed for biometric systems developers and integrators. The technology assures system performance and reliability with live face detection, simultaneous multiple face recognition and fast face matching in 1-to-1 and 1-to-many modes.

VeriLook is available as a software development kit that allows development of PC- and Web-based solutions on Microsoft Windows, Linux and Mac OS X platforms.

The VeriLook algorithm implements advanced face localization, enrollment and matching using robust digital image processing algorithms:

- Multiple face detection in a single frame.
- Simultaneous multiple face processing.
- Live face detection prevents breaching the system with photos in front of a camera.
- Face image quality determination.
- Tolerance to face posture allows for ± 180 degrees of head roll, ± 15 degrees of head pitch (nod) and ± 45 degrees of head yaw (bobble).
- Multiple samples of the same face can be stored in a biometric template.
- Identification capability.
- Small face features template.
- Features generalization mode allows to generate a template from several face images.



The following VeriLook SDKs are available:

- **VeriLook Standard SDK** is intended for **PC-based** biometric application development. It includes Face Matcher and Extractor component licenses, programming samples and tutorials and software documentation. The SDK allows the development of biometric applications for Microsoft Windows, Linux or Mac OS X operating systems.
- **VeriLook Extended SDK** is intended for biometric **Web-based** and network application development. It includes all features and components of the Standard SDK. Additionally, the SDK contains Face Client component licenses, sample client applications, tutorials and a **ready-to-use matching server** component.

VeriLook 5.2 algorithm technical specifications (for a PC with Intel Core i7-2600 processor running at 3.4 GHz)	
Recommended minimal image size	640 x 480 pixels
Minimal face size on an image	50 or more pixels between eyes
Single face template extraction time	0.055 – 0.145 seconds
Matching speed	120,000 – 960,000 faces per second
Template size (configurable)	4.0 – 35.2 kilobytes
Maximum database size	Limited by the amount of free RAM

VeriLook **algorithm demo** application, **30-day SDK Trials** and product **brochure** are available for downloading from Neurotechnology web site.



VeriFinger SDK

*Used in more than 1500 end-user product brands
in 100+ countries over the past 14 years.*

Fingerprint identification for PC and Web solutions

- NIST MINEX proven reliability
- FVC awards since 2000
- Multiplatform
- Numerous programming samples
- 90+ scanner models from 40 manufactures are supported
- Embedded SDK for Android devices optionally available

VeriFinger is a fingerprint identification technology intended for biometric systems developers and integrators. The technology assures system performance with fast, reliable fingerprint matching in 1-to-1 and 1-to-many modes.

VeriFinger is available as a software development kit that allows development of PC- and Web-based solutions on Microsoft Windows, Linux and Mac OS X platforms.

The VeriFinger algorithm follows the commonly accepted fingerprint identification scheme, which uses a set of specific fingerprint points (minutiae) along with a number of proprietary algorithmic solutions that enhance system performance and reliability:

- **Rolled-to-flat** fingerprints matching.
- Tolerance to fingerprint translation, rotation and deformation.
- Faster matching using pre-sorted database entries.
- Identification capability.
- Image quality determination.
- Adaptive image filtration.
- Features generalization mode.
- Scanner-specific algorithm optimizations for better performance.



The following VeriFinger SDKs are available:

- **VeriFinger Standard SDK** is intended for **PC-based** biometric application development. It includes Fingerprint Matcher and Extractor component licenses, programming samples and tutorials, fingerprint scanner support modules and software documentation. The SDK allows the development of biometric applications for Microsoft Windows, Linux or Mac OS X operating systems.
- **VeriFinger Extended SDK** is intended for biometric **Web-based** and network application development. It contains all features and components of the Standard SDK. Additionally, the SDK includes Fingerprint Client component licenses, sample client applications, tutorials and a **ready-to-use matching server** component.

VeriFinger 6.5 algorithm technical specifications (for a PC with Intel Core i7-2600 processor running at 3.4 GHz)	
Scanner resolution	500 ppi recommended 250 ppi minimal
Template extraction time	0.10 – 0.17 seconds
Matching speed	31,000 – 98,000 fingerprints per second
Template size (configurable)	200 – 6,000 bytes
Maximum database size	Limited by the amount of free RAM

VeriFinger **algorithm demo** application, **30-day SDK Trial** and product **brochure** are available for downloading from Neurotechnology web site.



VeriSpeak SDK

Speaker recognition for PC and Web applications

- Text-dependent algorithm
- Two-factor authentication with voice biometrics check and passphrase verification
- Regular microphones are suitable
- Multiplatform
- Embedded SDK for Android devices optionally available

VeriSpeak voice identification technology is designed for biometric systems developers and integrators. The text-dependent speaker recognition algorithm assures system security by checking both voice and phrase authenticity. Voiceprint templates can be matched in 1-to-1 (verification) and 1-to-many (identification) modes.

VeriSpeak is available as a software development kit that enables the development of PC- and Web-based applications on Microsoft Windows, Linux and Mac OS X platforms.

The VeriSpeak algorithm implements advanced voice enrollment and voiceprint matching using proprietary sound processing technologies:

- Text-dependent algorithm. The text-dependent speaker recognition is based on saying the **same phrase for enrollment and verification**. VeriSpeak determines if a voice sample matches the template that was extracted from a specific phrase enrolled by the person. This method assures protection against the use of a covertly recorded random phrase from that person.
- Two-factor authentication with a passphrase. VeriSpeak can be configured to work in a scenario, where each user records a **unique phrase** (such as passphrase or an answer to a “secret question” that is **known only by the person** being enrolled). Later a person is recognized by his or her own specific phrase. The overall system security increases as both voice authenticity and passphrase are checked.
- Liveness detection. A system may request each user to enroll a set of unique phrases. Later the user will be requested to say a specific phrase from the enrolled set. This way the system can ensure that a live person is being verified (as opposed to an impostor who uses a voice recording).



VeriSpeak is available as the following SDKs:

- **VeriSpeak Standard SDK** is intended for PC-based biometric application development. It includes Voice Matcher and Extractor component licenses, programming samples and tutorials and software documentation. The SDK enables the development of biometric applications for Microsoft Windows, Linux or Mac OS X operating systems.
- **VeriSpeak Extended SDK** is intended for biometric **web-based** and network application development. It includes all features and components of the Standard SDK with the addition of Voice Client component licenses, sample client applications, tutorials and a **ready-to-use matching server** component.

VeriSpeak 1.1 algorithm technical specifications (for a PC with Intel Core i7-2600 processor running at 3.4 GHz)	
Minimal audio sampling rate	11,025 Hz
Minimal audio bit depth	16-bit
Voice template extraction time	0.08 – 0.10 seconds
Matching speed (unique phrase mode)	1,000 voiceprints per second
Matching speed (fixed phrase mode)	1,800 voiceprints per second
Template size	4.5 – 5.0 kilobytes
Maximum database size	Limited by the amount of free RAM

The specifications are given for 5-second long voice samples.

VeriSpeak **30-day SDK Trial** and **product brochure** are available for downloading from Neurotechnology web site.





VeriEye SDK

Iris identification for PC and Web solutions

- NIST IREX proven accuracy
- Original proprietary algorithm
- Gazing-away eyes are recognized
- Multiplatform
- Numerous programming samples
- Embedded SDK for Android devices optionally available

VeriEye iris identification technology is intended for biometric systems developers and integrators. The technology includes many proprietary solutions that enable robust eye iris enrollment under various conditions and fast iris matching in 1-to-1 and 1-to-many modes.

VeriEye is available as a software development kit that allows development of PC- and Web-based solutions on Microsoft Windows, Linux and Mac OS X platforms.

The proprietary algorithm implements advanced iris segmentation, enrollment and matching using robust digital image processing algorithms:

- Robust eye iris detection even when there are obstructions to the image, visual noise and/or different levels of illumination.
- Automatic interlacing detection and correction results in maximum quality of iris features templates from moving iris images.
- Gazing-away eyes are correctly detected, segmented and transformed as if looking directly into the camera.
- Correct iris segmentation is obtained even when irises or their boundaries are not perfect circles and even not ellipses or the centers of the iris inner and outer boundaries are different.

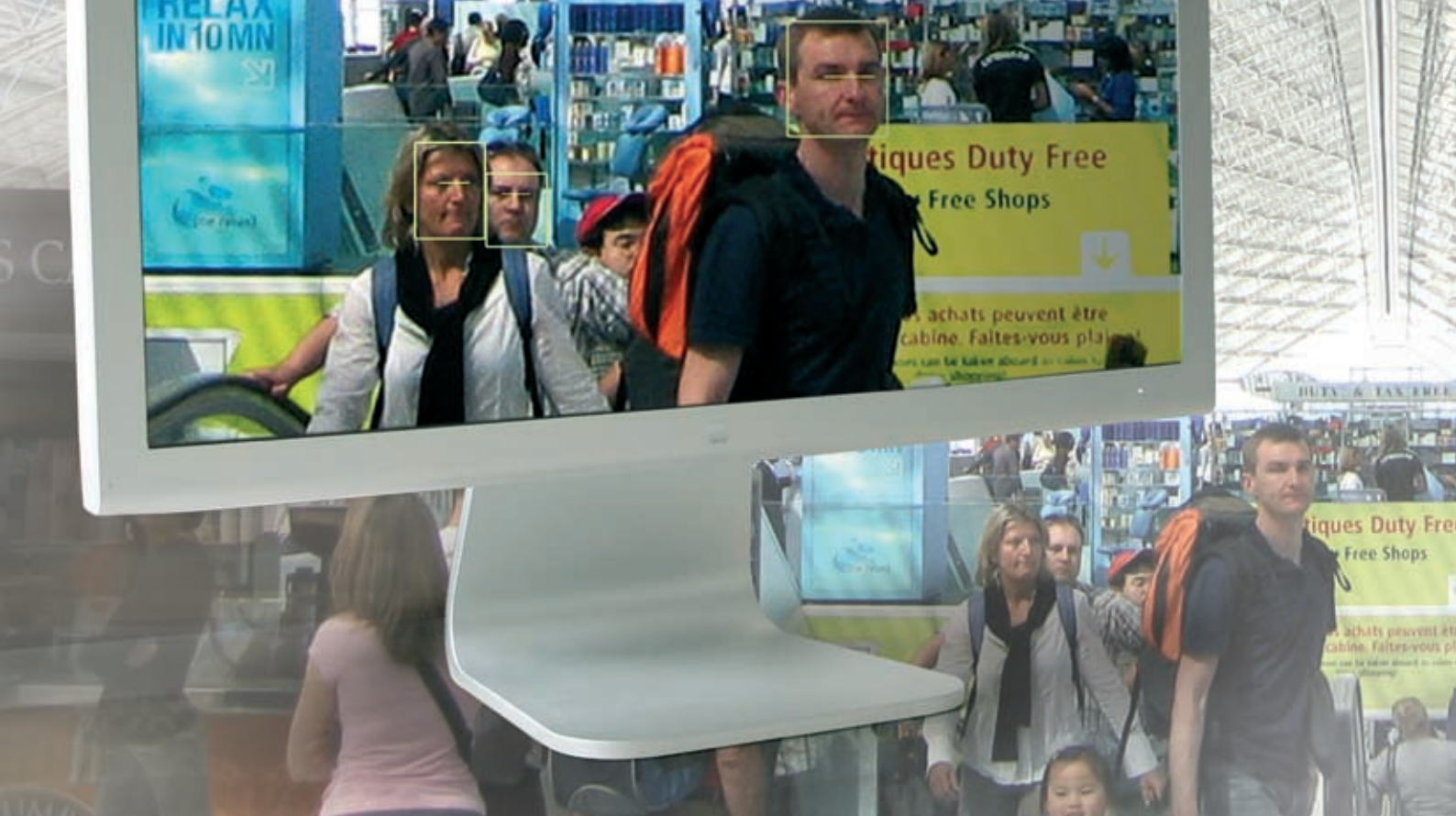


VeriEye is available as the following SDKs:

- **VeriEye Standard SDK** is intended for **PC-based** biometric application development. It includes Iris Matcher and Extractor component licenses, programming samples and tutorials, iris scanner support modules and software documentation. The SDK allows the development of biometric applications for Microsoft Windows, Linux or Mac OS X operating systems.
- **VeriEye Extended SDK** is intended for biometric **web-based** and network application development. It includes all features and components of the Standard SDK. Additionally, the SDK contains Iris Client component licenses, sample client applications, tutorials and a **ready-to-use matching server** component.

VeriEye 2.5 algorithm technical specifications (for a PC with Intel Core i7-2600 processor running at 3.4 GHz)	
Minimal iris image diameter	64 pixels
Recommended iris illumination	Near-infrared
Iris template extraction time	0.08 – 0.10 seconds
Matching speed	520,000 – 1,300,000 irises per second
Template size	2.3 kilobytes
Maximum database size	Limited by the amount of free RAM

VeriEye **algorithm demo** application, **30-day SDK Trial** and product **brochure** are available for downloading from Neurotechnology web site.



VeriLook Surveillance SDK

Face identification for video surveillance applications

- Real time face detection, template extraction and matching against watchlist database
- Simultaneous tracking of multiple faces in live video
- Automatic operation logs all events, as well as enrolls new faces to watchlist automatically
- Hi-res digital cameras support
- Network-based surveillance systems support
- Multiplatform

See demo video:

<http://youtu.be/mdhvRNYX0PI>



VeriLook Surveillance SDK is intended for developing biometric software that performs face identification using live video streams from high-resolution digital surveillance cameras. The SDK is based on VeriLook facial recognition technology and is used for passive biometric identification - when passers-by do not make any efforts to be recognized. List of possible uses includes law enforcement, security attendance control, visitor counting and other commercial applications.

The VeriLook Surveillance SDK allows to create applications for Microsoft Windows and Linux platforms.

The VeriLook Surveillance SDK has these specific capabilities:

- Real time performance. Face detection, features extraction and template matching with the internal database is performed in real time. The technology is designed to run on multi-core processors to achieve fast performance.
- Multiple face tracking. Once detected, the faces are tracked in all successive frames from the video source until they disappear from camera field of view. The tracking algorithm uses dynamic face and motion prediction models that make it robust to occlusions like other objects or even other faces. The algorithm is able to continue tracking a face even when it re-appears after being fully covered by occlusions (like walls, furniture, posters etc).
- Automatic operation. Face appearance, disappearance and tracking events are logged by the system. The detected faces are matched against the watchlist in the internal database and recognized faces are immediately reported to the system. Automatic enrollment from video stream and adding new facial templates to watch list on the fly is possible.



VeriLook Surveillance SDK creates face templates that are fully compatible with VeriLook SDK and MegaMatcher SDK. The SDK includes VeriLook Surveillance component, camera manager library, programming samples and tutorials, as well as SDK documentation.

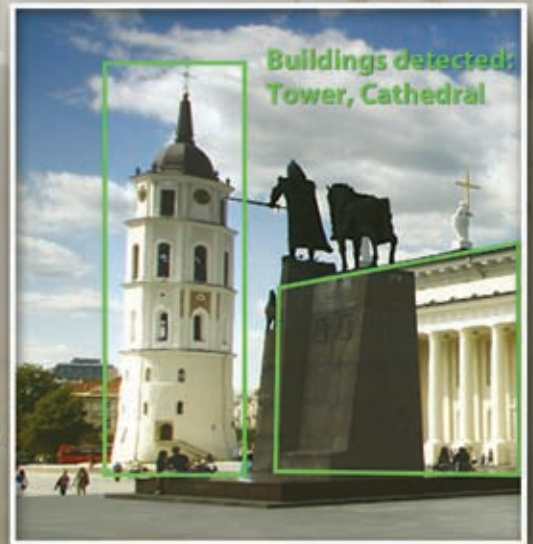
VeriLook Surveillance has certain tolerance to face posture that assures face detection and tracking:

- head roll (tilt) – ± 180 degrees (configurable);
 ± 15 degrees default value is the fastest setting which is usually sufficient for most near-frontal face images.
- head pitch (nod) – ± 15 degrees from frontal position.
- head yaw (bobble) – ± 45 degrees from frontal position;
 ± 15 degrees default value is the fastest setting which is usually sufficient for most near-frontal face images.

VeriLook Surveillance 2.1 algorithm technical specifications (for Intel Core i7-2600 processor with 4 cores running at 3.4 GHz)	
Minimal frame size	640 x 480 pixels
Minimal face size for face recognition	40 pixels between the eyes
Frame rate when tracking up to 3 faces	More than 20 frames per second
Frame rate when tracking up to 5 faces	More than 14 frames per second
Watch-list database matching time	Less than 1 second
Maximum watch-list database size	Limited by amount of free RAM

VeriLook Surveillance **algorithm demo** application, **30-day SDK Trial** and product **brochure** are available for downloading from Neurotechnology web site.





SentiSight SDK

Object recognition for robotics and computer vision

- Reliable innovative algorithm
- Real-time object detection, processing and tracking
- Tolerant to appearance, object scale, rotation and pose
- Webcams are supported
- Multiplatform
- Embedded SDK for Android devices optionally available

SentiSight is intended for developers who want to use computer vision-based object recognition in their applications. It enables manual and fully automatic object learning, and searching for learned objects in images from almost any camera, webcam, still picture or live video in an easy, yet versatile, way.

SentiSight is available as a software development kit that allows the development of object recognition systems for Microsoft Windows or Linux platforms.

SentiSight is designed to be as universal as possible and is able to perform fully automatic and manual object learning. Some of the potential applications for SentiSight include security systems, vision systems for robots, machine vision (like parts recognition in production lines), search engines that recognize objects in picture files, road signs recognition, etc.

The SentiSight algorithm has these capabilities for advanced visual-based object learning and recognition:

- Accurate object detection allows to find out **whether** a particular object is presented in a scene; **where** the object is located in the scene and **how many** instances of the object are there in the scene.
- **Two algorithms for object recognition.** Local features based algorithm uses small details of an object. Shape based algorithm is useful for the objects which do not have any distinctive details but have stable external or internal edges (boundaries).
- **Simultaneous multiple** 2D and 3D object detection and recognition
- Object evaluation allows to find out the size, orientation and scale of the recognized object.
- **Real-time** video streams processing.

See demo video:

<http://youtu.be/dqbhPce77Do>





SentiSight SDK distribution package contains:

- One SentiSight installation license;
- SentiSight learning and recognition algorithm;
- Device Manager Library that allows simultaneous capture from multiple cameras;
- Programming samples in C++, C# and Visual basic .NET;
- Programming tutorials in C/C++, C# and Visual Basic .NET;
- SentiSight SDK documentation.

SentiSight 3.1 algorithms technical specifications (for a PC with Intel Core i7-2600 processor running at 3.4 GHz; using 8 threads and 320 x 240 pixels images)		
	Local features recognition algorithm	Shapes recognition algorithm
Static background extraction and object mask separation speed	30 frames per second	
Single object frame during learning processing speed	0.014 seconds	0.215 seconds
Generalization time during learning (for 100 frames with the object)	0.3 seconds	Not applicable
Recognition speed	100,000 models per second	8,000 models per second

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